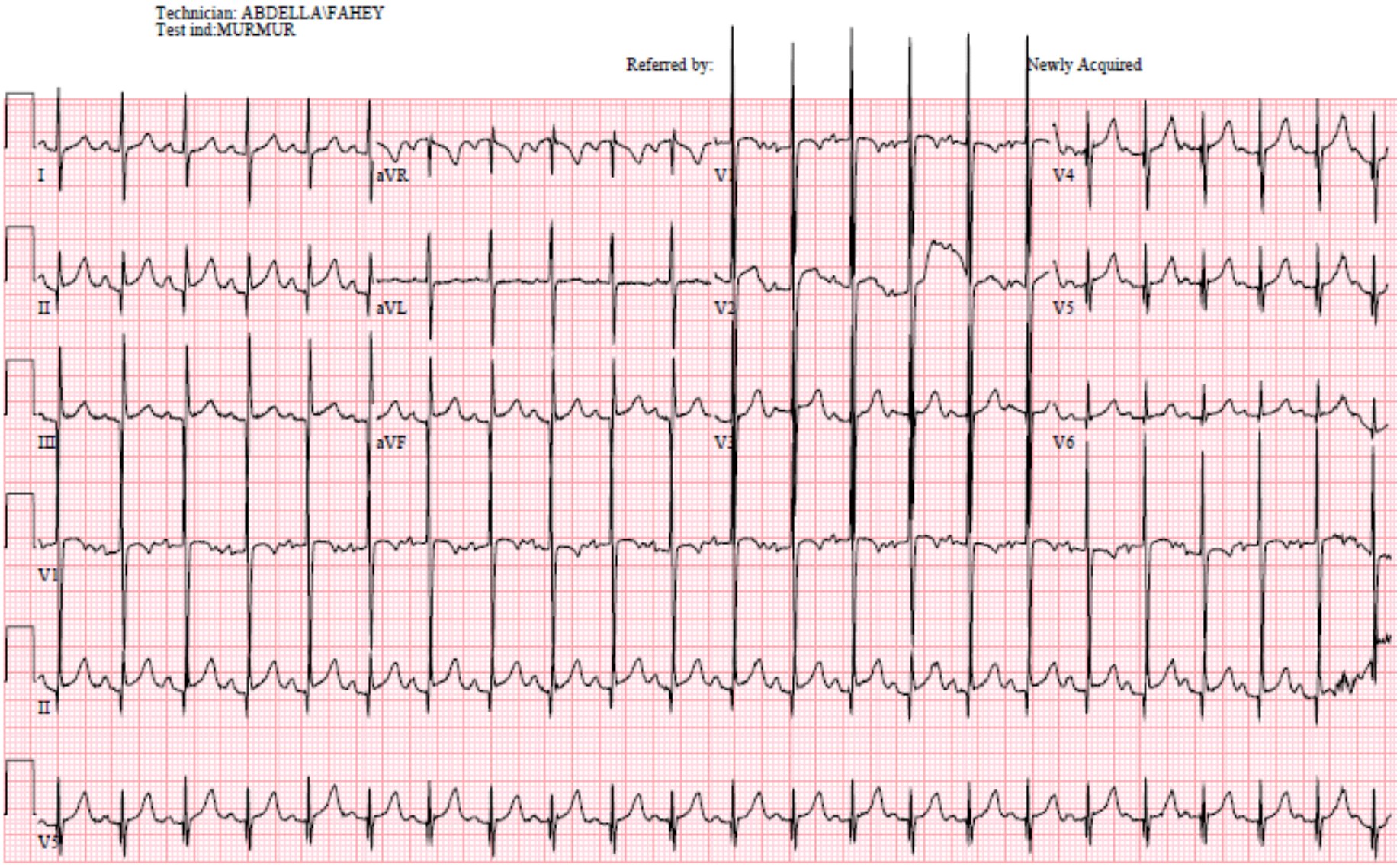
This is an ECG from an 8 month old girl seen recently in cardiology clinic. There are clearly voltage criteria present for both LVH and RVH when one looks at lead V1. She has a continuous murmur on her exam that radiates to the axillae and does not change with position.

1) There is another finding on the ECG consistent with RVH. What is it? (0.5 point)
2) There is another finding on the ECG consistent with LVH. What is it? (0.5 point)
3) What is the patient's most likely diagnosis given the ECG and physical exam findings? (1 point)
4) Bonus: Can you infer anything about the severity of the problem given the ECG findings? (1 point)



1) There is another finding on the ECG consistent with RVH. What is it? (0.5 point)
Look at the T waves in lead V1. They are biphasic (part up, part down). T waves in the right sided precordial leads, particularly lead V1, should be fully inverted until at least 10 years of age or so. If they are flattened, biphasic, or upright in lead V1 before the age of 10 years, think RVH. This is not an absolute rule, but should definitely make you suspicious of RVH.

2) There is another finding on the ECG consistent with LVH. What is it? (0.5 point)
Note the deep Q waves in the inferior leads (leads II, III, and aVF). Particularly in leads III and aVF they are huge!!! Deep Q waves (greater than or equal to 5 little boxes) in the inferior leads or lateral precordial leads (V5, V6) are suggestive of LVH.

3) What is the patient's most likely diagnosis given the ECG and physical exam findings? (1 point)
The re are only a few possibilities for continuous murmurs: venous hum, patent ductus arteriosus (PDA), or some sort of vascular malformation (e.g. arterovenous fistula, coronary-cameral fistula, etc). A venous hum is an innocent continuous murmur heard near the clavicles. This sound will disappear in the supine position or if the jugular vein is occluded on the side you hear the murmur. PDA murmurs typically radiate to the axillae, and should not change much with position. A PDA is most likely here, as AVM's and coronary-cameral fistulae are not nearly as common.

4) Bonus: Can you infer anything about the severity of the patient's problem given the ECG findings? (1 point)
A PDA allows blood to go from the systemic to pulmonary circulation (down the path of least resistance). This results in LV volume overload as the LV needs to pump a greater volume of blood to maintain normal cardiac output, since a lot of the blood ends up going back toward the lungs instead of out to the body. The presence of LVH on ECG suggests that the PDA is big enough to cause significant LV dilation (remember an ECG can't tell the difference between chamber enlargement with normal thickness and increased chamber thickness). The presence of RVH on the ECG suggests one of 2 things: 1)the PDA is big enough to allow pressure equilization between aorta and pulmonary artery, resulting in a pressure load on the RV, or 2) the pulmonary vascular resistance in this patient is elevated, resulting in a pressure load on the RV.
In short, the findings of LVH and RVH in a kid with a PDA make you worry the PDA is large and hemodynamically significant.